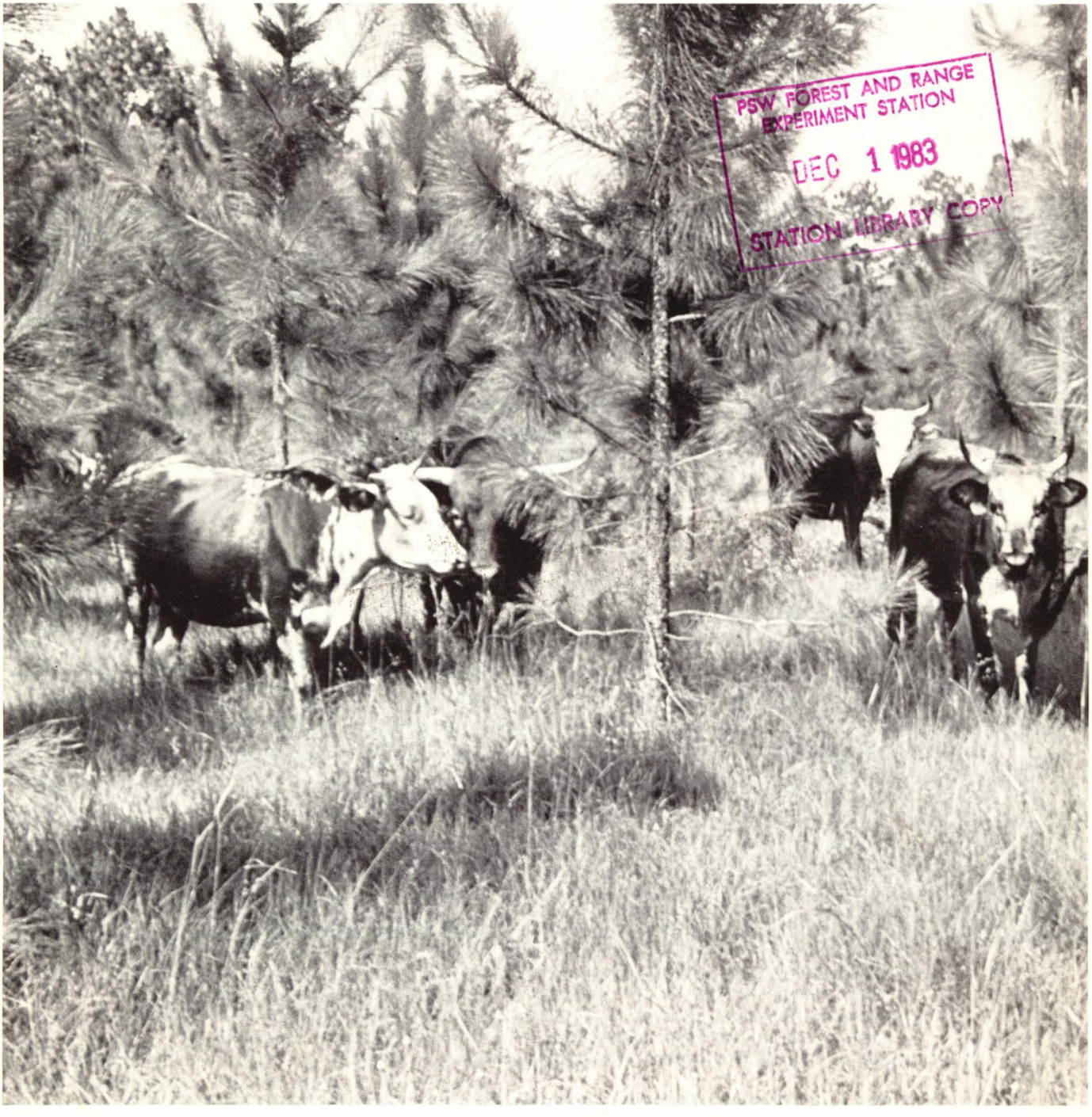
SD11
.U5952
No. 2

84 2173 F55

d States
tment of
ulture

t Service
ern Region

Managing Pine Trees and Bahiagrass For Timber and Cattle Production



PSW FOREST AND RANGE
EXPERIMENT STATION
DEC 1 1983
STATION LIBRARY COPY

General Report R8-GR 2
October 1983

Metric Equivalents

1 acre = 0.4047 hectare
1 inch = 2.54 centimeters
1 foot = 0.3048 meter

USDA Forest Service
Southern Region
1720 Peachtree Road, N.W.
Atlanta, Georgia 30367

National FS Library
USDA Forest Service

MAR 8 2011

240 W Prospect Rd
Fort Collins CO 80526

Additional copies of this report can be purchased from **Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.** Ask for *Managing Pine Trees and Bahiagrass for Timber and Cattle Production, General Report R8-GR 2, Stock number 001-000-04347-1.* Write to the above address for price and ordering information. For faster service, call the GPO order desk at (202) 783-3238 and charge your purchase to your VISA, MasterCard, or GPO Deposit Account. Discounts are available for purchases of more than 100 copies.

MANAGING PINE TREES AND BAHIAGRASS FOR TIMBER AND CATTLE PRODUCTION

by

Nathan A. Byrd and Clifford E. Lewis[1]

Since the early 1950's, many southern landowners have incidentally grown pine trees and bahiagrass on the same land. During the Conservation Reserve Soil Bank Program, over 1.7 million acres were planted to pine trees in the coastal States where bahiagrass is frequently used as a pasture grass. Although there are no accurate estimates of the acres of trees planted in bahiagrass fields, large acreages of the Soil Bank pine trees were established on bahiagrass fields (figure 1). Since the program's end in 1963, thousands of additional acres of bahiagrass pasture have been seeded naturally or deliberately planted to pine. The information in this bulletin applies primarily to the eastern coastal plain region and to the south, where sandy and gently sloping or level sites are found. This bulletin is intended to help foresters and related professionals to assist landowners who have both cattle and timber management capabilities and objectives, along with the financial and physical resources needed to make such management practical and profitable.

Figure 1. — Bahiagrass has persisted and responded to prescribed fire in this soil bank planting of slash pine in pasture in the mid-1950's.

[1]Nathan A. Byrd was formerly a multiple-use specialist, Southeastern Area, USDA Forest Service, now consulting forester. Clifford E. Lewis is range scientist, Southeastern Forest Experiment Station, USDA Forest Service.

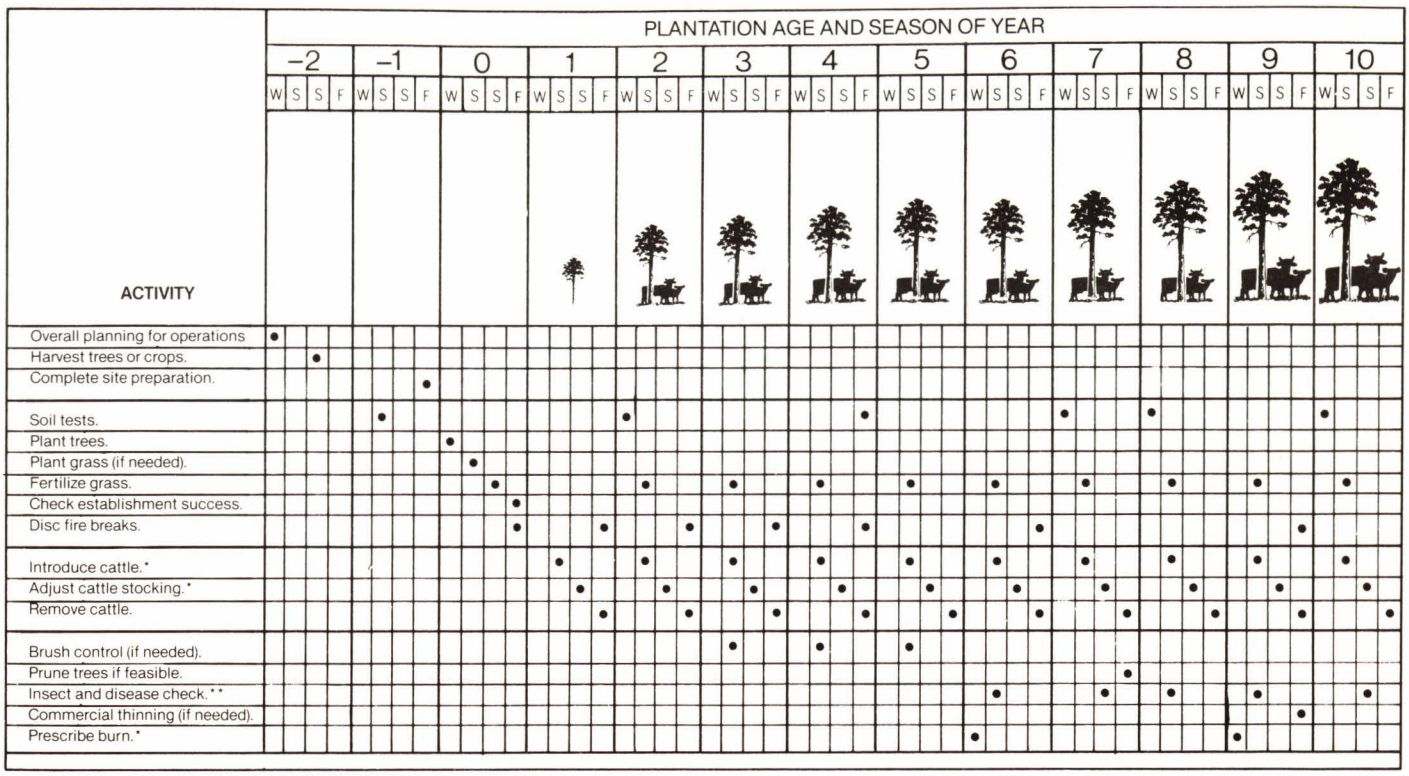
This information applies to the use of either large or small (down to 25 acres) tracts of forest and/or pasture land. Using only native forage, the stocking rate for cattle may vary from 60 to 10 acres per cow/calf for a 9-month grazing season. On the other hand, stocking rates on fertilized bahiagrass may be from ¾ acre to 2 acres per cow/calf for a similar period. This shade-tolerant species of grass lends itself very well to either improved, open pastures or tree-covered pastures which allow landowners to grow trees and grass simultaneously. Research shows also that on many sites tree growth increases where fertilizer is applied for grass production. This type of intensive management has pretty well been developed by landowner trial and error and has not been researched thoroughly. However, many landowners are practicing it, want to practice it, or have the opportunity to do so.

Planning

Initially, soils should be tested and other land resource factors examined to determine if the site is suitable for the purposes. Local extension, Soil Conservation Service (SCS), and State forestry agency specialists can help determine suitability. For best results, planting sites should be free of debris, woody sprouts and weeds. The site should appear much like freshly abandoned crop land or open pasture unless bahiagrass is already well established. Select the pine species best suited for the site. Favor slash pine over loblolly because of its early rapid height growth and open crown, where possible. If longleaf pine is chosen, a much greater knowledge and application of management will be needed, especially during the first 4 to 5 years because of the slower initial height growth of this species. At least every third row should be wide enough to allow truck passage for several years. Experience has shown that tree spacings of 6 x 16 or 8 x 12 feet are best because close row spacings may create access problems for fertilizer spreaders and mowers. Also, crowns tend to close too rapidly. However, if closer row spacing is desired, at least every third row should be at least 12 feet between rows. A suggested activity schedule is shown in figure 2. Additionally the following items merit consideration:

1. Think about the best tree row alignment for your objective. Use an east-west row alignment for maximum sunlight exposure on grass. Plant on the contour if erosion is a factor.
2. Where possible, select genetically improved trees for planting, particularly those resistant to fusiform rust and other diseases of pine. Plan fertilization practices according to soil tests and grass production needs.
3. Unless grass is already established, plant trees in the winter just before sowing the bahia seed because newly sown grass does not affect initial tree survival. If trees are to be planted in established bahiagrass sod, severe soil moisture shortages in the summer may require some site preparation in 12- to 16-inch bands where trees are to be planted. This step is not usually required for loblolly and slash pine, but if local moisture conditions are adverse this step may be needed for the initial survival of these species. Such site preparation will likely be needed for longleaf pine. Application of approved herbicides, scalping, or discing in strips are all effective methods.
4. Coordination for wildlife and other objectives may suggest unusual pasture configurations, a change in the location, or altering the size of pastures. However, because fences and maintenance are large initial costs, any plan for modification should first consider such costs.
5. Water for livestock, holding and loading pens, and other improvements will be needed. Plan their location for ease of installation and use. If cattle are to be concentrated on small plots of ground for a lengthy period, trees should not be planted in those areas.
6. Because the pine/bahiagrass pasture is likely to be a part of a total grazing resource, tree planting and herd handling improvement locations and alignment should consider access to native pasture, crop residue fields and other improved pastures or hay pastures.
7. Although timber harvests, prescribed burn-

Figure 2. – Thirteen-year schedule of activities for intensive, integrated cattle-timber management of planted pine and bahiagrass pasture.



*These schedules apply only to loblolly and slash pines. Longleaf pine may require much different treatment, especially in the first 6-8 years.

**Insect and disease checks should be made in spring and/or summer.

ing and other timber cultural practices will not be carried out for several years, design and initial implementation should consider these activities.

8. When a particular species is selected for a site, review the past history of insect and disease problems in that area. Such information is available for many areas from your State forester's offices. If the risk of loss is very great for a given tree species, consider alternate sites or species.
9. Are firebreaks needed for protection from wildfire or future prescribed burns?

Establishment of Trees

Sites should be prepared as cleanly as possible because woody sprouts and weeds will sap moisture and nutrients from trees and grass. Stumps, unburned windrows, brush piles and other debris will complicate management. If possible, they should be removed before trees are planted.

Suitable spacings for trees are 6 x 12 feet (605 trees per acre), 8 x 15 feet (363 trees per acre), or 8 x 12 feet (454 trees per acre). The denser spacings will naturally prune better. The wider spacings will provide easier access for fertilizer and mowing and harvesting equipment. Open conditions remain longer under such spacing, which will enhance grass production. If the area is to be mowed for hay, the wider spacing will reduce the possibility of injury and subsequent insect and disease problems. Trees should be carefully planted to assure the row alignment and spacing desired for good survival and initial growth.

Plant improved slash or loblolly pine on suitable sites. Because slash pine has fewer limbs and prunes better than loblolly, it should be selected if the site and other conditions, such as resistance to local insects and diseases, are suitable. Longleaf pine may also be planted. However, because

of the slow, initial height growth of longleaf pine, cattle should not graze the area until the trees reach a height of 4 feet. Prescribed burns may also be required at an earlier age for brown spot disease control.

Plant trees in months recommended by your State forestry agency. If tree seedlings are to be stored longer than 1 day before planting, ask about and follow carefully the storage and handling instructions.

Establishment of Grass

Seeding is the most efficient way to establish a stand of bahiagrass. If the area is clean and disturbed enough, after tree planting for good seed germination, seed should be sown at the locally recommended rates and season. Soil pH should be corrected where needed to best suit bahiagrass.

Seeding can be done by any method that avoids damage to young pine seedlings. Farmers have successfully used ordinary farm equipment, hand seeders, or aerial application to establish grass. Research has not yet thoroughly shown the best variety of bahiagrass to use in forest settings. Both Argentine and Pensacola varieties are used. Observations and comments from landowners in the eastern Gulf Coast indicate that Pensacola bahiagrass is preferred because it has better shade tolerance and winter hardiness. Argentine is suitable only along the Gulf Coast, and even there it may be winterkilled about 1 in every 3 years.

Cattle should remain off the grass about 1 year. Because, ideally, trees are to be protected from livestock grazing for 18 months, the grass will likely be ready to graze at the end of this period. Insects and diseases of grass should be treated as in any open, improved pasture. Take care to protect trees from damage by equipment.

Cultural and Other Treatments After Establishment

Although different in appearance, a tree-covered pasture can be managed much like any improved pasture. Fertilization rates should be the same as if the trees were not present. Take soil samples periodically and apply fertilizer accordingly for grass production. Because bahiagrass tends to be tough by midsummer if not grazed closely, some nitrogen may be needed. However, this should be determined by local conditions. Periodic mowing especially during the second or third year may be needed to control weeds and brush. Advice on bahiagrass pasture management is available from local county agents, SCS specialists, agricultural experiment stations, and other sources.

Fertilization

Forest research has shown that nitrogen fertilization increases loblolly wood production on all but one soil type out of 11 in the Coastal Plains and Piedmont sections of several southeastern States. Slash pine has shown similar responses. Limited research work has been done on repeated fertilization of pine-pasture combinations. However, actual examples of annual fertilization for over 28 years show no harm to trees. On the contrary, wood growth was increased. Soil type determines tree responses to a great extent. Wood production should increase in most instances (figure 3). However, until trees are over a year old, nitrogen fertilizers should be limited to only that needed for bahiagrass establishment. As trees and grass get older and establish better root systems, there is much less possibility of damage.

Fertilizer application techniques include a truck-mounted fertilizer spreader, aerial and tractor-spreader application. Care should be taken to minimize limb breakage and avoid tree trunk damage to reduce the potential for buildup of forest insects and the possible spread of pitch canker fungus.

With increasing nitrogen costs, you may wish to consider sowing clover in the bahiagrass. This can be done when grass seed is sown or any time thereafter. Research on clovers, especially shade-tolerant varieties such as some species of subterranean clover, is progressing rapidly, so you may wish to get current information on them from local and State agricultural experiment stations. Special management of grazing may be needed to maintain a stand of clover.

Figure 3.—Slash pine planted on median sites with bahiagrass and managed as improved pasture shows excellent growth after 4 years (A) and another after 8 years (B).

Replanting or Reinforcement Planting of Trees and Grass

Trees and grass should be checked in the fall after the first growing season to determine if more work is needed to obtain a satisfactory stand. If additional trees or grass are needed, the area to be treated should be excluded from grazing until satisfactory stands are obtained, unless livestock grazing is deferred on the entire tract. Bahiagrass spreads rapidly and seeds are disseminated by livestock, so small areas will likely become covered or seeded without additional expense.

Firebreak Construction and Maintenance

The extent and width of firebreaks should be determined by the history of wildfire, and the types and extent of fuels (dead branches, brush and other burnable plant material or debris) in the area. Plan the locations for firebreaks to coincide with the layout of planting rows and fence construction because some firebreaks will likely parallel fences. Construct firebreaks in conjunction with fence building. The firebreak surface should be clean of burnable fuels when the line is completed. Base the width of firebreaks on the adjacent fuel content and quantity. Exterior boundary lines should be 10 or more feet wide unless fuels are very light. Interior lines need not be as wide because the fuel buildup will be minimal after the end of the second year. However, trees are most susceptible to destruction by wildfire in the first 5 years. After trees are 10 to 12 feet tall, they should be able to withstand fires if forage is grazed closely in the late fall before removal of livestock. Interior firebreaks can be used for prescribed burning, but need not be maintained annually after trees are above 10 feet (unless the areas are not grazed adequately).

Initial Cattle Stocking

Grazing should be delayed until trees are about 18 months old and the grass is well established. During the first three years of grazing, cattle stocking should be applied cautiously, beginning with about 1 cow/calf to 3 acres for a 7- to 9-month grazing season. By the time trees are 3 to 5 feet in height, stocking should be based on forage production, because trees are out of danger from major damage by livestock. Bahiagrass can and should be grazed closely (½- to 1-inch).

Annual fertilization of grass is necessary for

good beef production. If fertilization is deferred, cattle stocking must be adjusted downward accordingly, probably to one cow/calf on 5 or more acres for a 9-month season. Stocking rates, as in the fertilized condition, should be based on forage yields and cattle condition.

Pruning

Pruning of tree limbs is rarely economical or needed for timber production in southern forests. Occasionally, pruning will help maintain access lanes for truck and fertilizer spreaders. In rare instances, a landowner may have spare time or labor to remove lower limbs to permit more sunlight to penetrate the forest floor. *If* pruning is done for better access or for forage release, there are several *don'ts* that need to be considered to avoid damage to the trees and obtain the best results. The following guidelines do *not* take into consideration pruning for clear lumber in sawlogs because it is not economical:

1. Early pruning is needed for best access and forage release. For example, if limbs are closing in and truck access is becoming difficult when trees are 16 to 20 feet tall, prune only the rows needed for access, and up to about 8 feet, or high enough to allow easy passage of trucks. Limbs will be small and easily pruned.
2. Keep pruning costs to a minimum by pruning only that side of the tree where the truck passes. Do not bother to prune dead limbs. They will fall off or get broken off by the truck or spreader. Prune no more than 50 percent of the total height of the tree.
3. Prune in the dormant season (winter) when possible. During the spring and summer, when trees are growing rapidly in diameter, the bark tends to slip from the wood easily, leaving wounds where the possibility of fungal infection and insect attraction are high. If sharp saws or shears are used properly, there is no reason why pruning might not be done all year. However, in periods of extreme drought and other times when trees are under stress, delay pruning to avoid insect vulnerability.
4. Use a pruning saw that will allow a person to stand on the ground and prune to 8 feet. An axe, brush hook, hatchet and other similar tools rarely give good results, and are more dangerous to use than pruning saws. Prune limbs flush with the tree and prune the bottom part of the stub as close as the top part. Avoid tears in the bark or wood of the tree by using careful saw strokes and sharp tools.

Debris from pruning will reduce forage production slightly for a short time. Livestock trampling should disintegrate the debris within 6 to 12 months. Stocking rates need not be adjusted if pruning is done at an early age and for access (every few rows) only.

Control of Brush and Weeds

Bahiagrass will not produce well if weeds and woody sprouts and seedlings are allowed to dominate the understory. Sprouts and seedlings become especially troublesome to access if allowed to develop. Even with very intensive site preparation and grazing, some control of weeds and woody sprouts will likely be needed during the first 4 years when trees are too young to withstand heat from prescribed fire. If weed control is needed, take care to avoid equipment damage to trees. If a herbicide is needed select one approved for grazed pastures, and with the ability to kill hardwood sprouts without harming pine trees. As livestock grazing rates increase, little if any control is needed. Ordinarily, cattle will browse and "bush back" sprouts, thus retarding development until prescribed fire can control them. Brush and weed control can be minimized by:

1. Preparing planting sites intensively.
2. Allowing maximum grazing pressure as early as possible without excessive damage to timber values.
3. Prescribe burning as soon in the rotation as possible.
4. Continuing grazing pressure at the optimum level, and prescribe burn at 3-year intervals.

Prescribed Burning

In situations where the grass fuel is removed each year by grazing, prescribed fire can usually be applied after trees are 12 feet tall. The first two or three burns should be winter back-fires with fire lines at no more than 1,320 feet apart. After that, frequency and type of burning will

depend on the amount of fuel and the extent or type of woody brush. Even though these pastures appear to have little fuel, buildup of pine straw on the forest floor can cause fire damage to trees if the burn is not conducted carefully. Also, needle-scorching burns can greatly increase needle fall following burns.

The preceding recommendations for burning should not be applied where most of the grass fuels are *not* removed by livestock before burning. Greater precautions are required where there are large amounts of burnable fuel.

Although prescribed fire is an efficient tool for removing pine needles, dead grass, and unwanted woody sprouts or weeds from the area, it should always be applied with caution. State forestry agencies are responsible in most States for smoke control from prescribed fire and require a burning permit. Before planning and conducting such burns, contact the proper agency.

Commercial Thinnings

Commercial harvests of pines may be possible as early as 10 years. The timing depends on several factors such as site capability, tree spacing, markets, and the owner's objectives for timber growing. If bahiagrass production and a sawtimber rotation is the objective, stands should be thinned to 70 square feet of basal area at 5- to 10-year cutting cycles (where markets are available). Such thinnings ideally should be frequent and leave a stand of the most healthy, dominant trees.

By the time the stand is old enough to thin, truck access may become difficult. Removal of every third or fourth row plus other selected trees, may be a good solution (figure 4). If row thinning is done, make every possible effort to remove all other trees that will die before the next thinning, in addition to those in rows. If there is a choice, select wood buyers who use whole tree chippers during harvests. This type of operation removes almost all limbs, leaving very little debris to inhibit grass growth or provide breeding material for pine engraver (Ips) beetles. Take care to protect the "leave" trees regardless of the harvest method used.

Figure 4. — This intensively managed stand was thinned after only nine growing seasons. Note how livestock have eliminated the buildup of slash from thinning.

Tips on Overall Management Flexibility

Management of trees, cattle and forage is more complex than management for single products, but can yield profitable returns for many years (figure 5). Markets for beef and timber vary over time and the needed action cannot always be taken at the most beneficial time for all products. For example, you may not have enough livestock to eat the available forage; the grass will build up and you should then mow or burn it before the next grazing season. The best time for burning is winter, but mowing, and possibly haying, can occur during the growing season. Established bahiagrass is highly shade-tolerant, so it will persist even if left unfertilized and can be restored quickly to a grazable quality and quantity by timber thinning and prescribed burning.

If fertilization becomes too costly, reduce cattle stocking accordingly. The pasture can be managed without fertilization for many years without destroying the bahiagrass but, of course, with limited beef production.

Figure 5. — This slash pine-bahiagrass pasture has been used for livestock grazing for over 27 years in conjunction with crop land residue, native forest, and open pasture.

Coordination with Other Uses and Values

Wildlife values of improved pastures are limited by the intensive grazing by livestock of all existing vegetation within their reach. However, tree canopies provide additional diversity, vertical structure, and cover. Although limited in potential use by many species, pine-bahiagrass pastures can be designed and managed to favor conditions for several wildlife species. For example, winter forage species may be planted in the pasture or in firebreaks. You may adjust the size and configuration of pastures and the location of water holes in relation to other types of forest habitat to benefit certain wildlife species. Such designs might look like one of the tracts shown in figure 6.

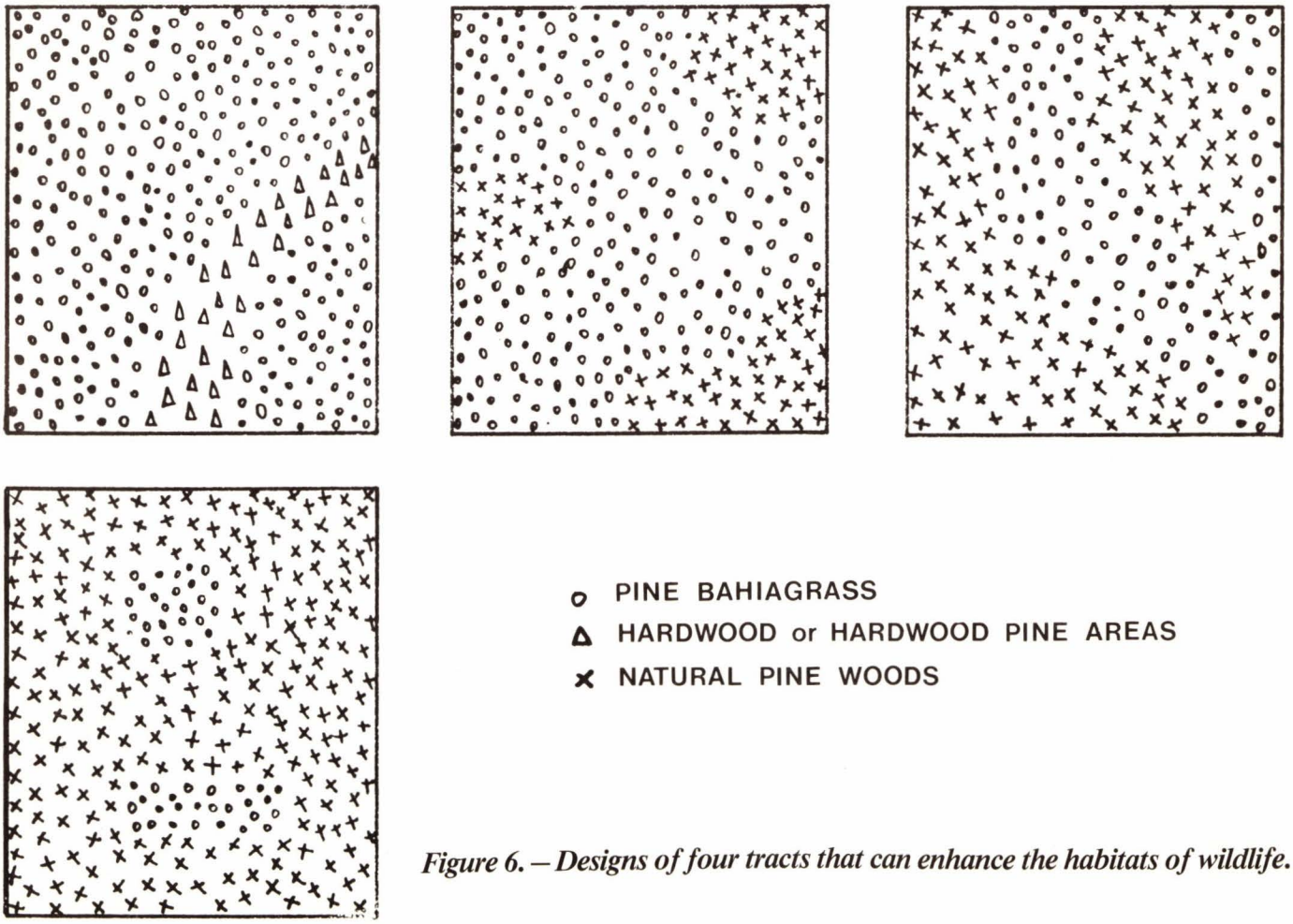


Figure 6. — Designs of four tracts that can enhance the habitats of wildlife.

The configurations in figure 6 are but a few that can be made to encourage wildlife use of the pasture and pasture edge. Boundary firelines, if seeded to plants that supply green browse and forage in the winter, will provide very attractive food sources for wildlife such as the wild turkey, white-tail deer, rabbit and quail. Local, State or consulting wildlife management specialists can be helpful in planning for wildlife objectives.

Economics

The economic feasibility of establishing and managing a cattle herd on bahiagrass-pine pastures is determined by many factors. The existence of water, fences and nearby security features such as ranch or farm homes are all plus factors. Very high site preparation and tree/grass establishment costs, lack of water, out-of-the-way locations, and a lack of expertise and equipment are negative factors. Each opportunity must be examined on its own merits to determine if the operation is likely to prove profitable. The unique requirement for such multiple-use operations is expertise in both timber and cattle management. As professionals (and the landowners with whom they work) gain more experience in these operations the combined uses of land for timber and cattle can be expected to increase.

References

Clark, O. V. A reference unit on beef cattle production. State College MS; Mississippi State Univ., State Board for Vocational Education; 1961. 393 p.

Colorado State Univ. Great Plains beef cattle feeding handbook. Fort Collins, CO: Colorado State University Cooperative Extension Service; [n.d.]. [looseleaf notebook of papers numbered GPE-1000 through GPE-9450; continual update with new papers added].

Fowler, Stewart H. Beef production in the South. Danville, IL: The Interstate Printers and Publishers; 1969. 858 p.

Galloway, Frazier T., comp. Georgia agricultural facts, 1977 through 1978. Athens, GA: Georgia Department of Agriculture, Georgia Crop Reporting Service; and U.S. Department of Agriculture, Statistical Reporting Service; 1979. 90 p.

Holt, Carl P.; Halverson, Sam D. Beef cattle husbandry study course. Technical Publication R8-TP 5. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region; [in press]. 256 p.

Mississippi State University. Basic principles of animal science. Agricultural Publication No. 1017. Mississippi State, MS: State Department of Education, Division of Vocational Tech. Education; 1976. 58 p.

Stoddard, L.A.; Smith, A.D.; Box, T.W. Range management. 3rd ed. New York: McGraw-Hill; 1975. 532 p.

U.S. Department of Agriculture. Agricultural statistics, 1950. Washington: U.S. Department of Agriculture; 1951. 791 p.

U.S. Department of Agriculture. Agricultural statistics, 1955. Washington: U.S. Department of Agriculture; 1956. 610 p.

U.S. Department of Agriculture. Agricultural statistics, 1965. Washington: U.S. Department of Agriculture; 1965. 635 p.

U.S. Department of Agriculture. Agricultural statistics, 1970. Washington: U.S. Department of Agriculture; 1970. 627 p.

U.S. Department of Agriculture. Agricultural statistics, 1976. Washington: U.S. Department of Agriculture; 1976. 613 p.

U.S. Department of Agriculture. Agricultural statistics, 1978. Washington: U.S. Department of Agriculture; 1978. 605 p.

U.S. Department of Agriculture. Southern Region annual range reports. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region; 1940 through 1978.

U.S. Department of Agriculture. Southern regional beef cow-calf handbook. Washington: U.S. Department of Agriculture, Extension Service; in cooperation with the Extension Service agencies of the Southern States; [n.d.]. [Notebook of individual papers numbered SR 6000 through SR 8003.]

University of Missouri. Beef cow-calf manual. Manual No. 104. Columbia, MO: University of Missouri, Columbia Extension Division; [n.d.]. 104 p.